

compounds are held together ?—what are the forces of a higher order, as we cannot help believing, by which the course of vital action in organized bodies is kept up ? in these and other cases, we have extensive departments of science, but we are as yet unable to trace the effects to their causes ; and our science, so far as it is positive and certain, consists entirely of the laws of phenomena.

In his work on the History of the Inductive Sciences, Whewell shows how all the sciences have been following the order now pointed out. First, in every science there is a preparatory period, or the prelude of discovery, in which inquirers are busily employed in discovering the laws of phenomena. Then, secondly, there is the period of the discovery itself. Thirdly, there is the period of deduction in which the law or cause is verified, and carried out to the explanation of existing phenomena. Among the earliest discoveries in astronomy may be reckoned the formation of the notion of the year, and the grouping of the heavens into constellations. It was ascertained by the Chaldeans that, after a certain period of years, similar sets of eclipses return. The discovery of such laws formed the prelude to the period of Hipparchus. Hipparchus resolved the phenomena into higher laws, of which epicycles and eccentrics were the best expression. Coming down to modern times, we find, first, certain useful observations as a prelude, then the discovery of the laws of Kepler, and a sequel to this discovery in the application of these laws to the planets and moon. The laws of Kepler, and the laws of motion as established by Galileo, were the prelude to the discovery of Newton, which discovery has a train of verification reaching down to the present day.

Whewell endeavours to trace the same order in what he calls the secondary mechanical sciences. Thus, in optics we have a period of prelude, during which the laws of phenomena were carefully observed, and as an example, he gives Sir Isaac Newton's rule for the polarizing angle of different bodies, that rule being that the index of refraction is the tangent of the angle of polarization. Such laws formed the preparation to the discovery of the undulatory theory, (supposed by Whewell to be the true one,) as established by Young and Fresnel, and now being corrected and verified. In the science of heat, inquirers have in time past been busily employed in collecting laws of phenomena in regard to conduction, radiation, polarization, which it is hoped may speedily issue in the true theory. In chemistry, and the sciences which treat of electricity, magnetism, and galvanism, the object has not been to discover laws of phenomena. An example, we have the law of definite proportions as developed by Lavoisier, and which may be regarded as consisting of three parts : that elements combine in definite proportions, that these proportions operate reciprocally, and that when between the same elements several combining proportions occur, they are related as multiples. The singular fact detected by Faraday and others in electricity and magnetism is, that to have brought

us to the very verge of some brilliant discovery in these departments of nature.

Such is the extensive induction of Whewell in reference to the development of scientific inquiry. It furnishes, we conceive, a striking illustration and confirmation of the views advanced in the text. And, if we do not mistake, the view* now set forth in these reflections serve to give an explanation of the program which the able historian of philosophy has so well described. We are now in circumstances to apply the distinction of which Whewell makes much profitable use. «!» his own researches, and to furnish, if we mistake, not, the cause of those laws of phenomena which he has so skilfully traced in the history of the inductive sciences.

Let us take along with us these three general truths—Kirchhoff that God has arranged the universe that general results or findings everywhere full under our

* Vol. II. pp. 55, 60.